IN THE U.S. PATENT AND TRADEMARK OFFICE

APPELLANTS:	John A. Dispenza et al.	Confirmation No.: 5477
APPL. NO.:	10/029,461	Group No.: 1793
FILED:	December 21, 2001	Examiner: Kuang Y. Lin
FOR:	HEAT EXCHANGING APPARATUS AND METHOD OF MANUFACTURE	
Attorney Docket:	129250-001049/US	

APPELLANTS' BRIEF ON APPEAL

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APPELLANTS' BRIEF ON APPEAL

I. REAL PARTY IN INTEREST:

The real party in interest in this appeal is Lucent Technologies, Inc. Assignment of the application was submitted to the U.S. Patent and Trademark Office and recorded at Reel 012427, Frame 0220.

II. RELATED APPEALS AND INTERFERENCES:

There are no known appeals or interferences that will affect, be directly affected by, or have a bearing on the Board's decision in this Appeal.

III. STATUS OF CLAIMS:

Claims 1-4, 6-12, 14-16, 19 and 20 are pending in the application, with claims 1 and 9 being written in independent form. Claims 5, 13, 17 and 18 have been cancelled.

Claims 1-4, 6-8 and 19 were rejected under 35 U.S.C. §103(a) based on the combination of U.S. Pat. No. 4,344,477 to Miki et al ("Miki") in view of U.S. Pat. No. 5,040,589 to Bradley et al ("Bradley"). Claims 9-12, 14-16 and 20 were rejected under 35 U.S.C. §103(a) based on the combination of Miki, Bradley, and Japanese reference JP 6-292,944 ("944 reference").

Claims 1-4, 6-12, 14-16, 19 and 20 are being appealed.

IV. STATUS OF AMENDMENTS:

A Request for Reconsideration ("Request") was filed on December 10, 2009. In an Advisory Action dated December 17, 2009, the Examiner stated that the Request was considered but did not place the application in condition for allowance.

V. SUMMARY OF CLAIMED SUBJECT MATTER:

(i). Overview of the Subject Matter of the Independent Claims

The present invention is directed at methods for forming heat exchange surfaces on a core object, including the feature of cooling a heated metal slurry to form a contact area that provides a substantially continuous void free interface between a core object and fins. More specifically, independent claim 1 reads as follows (specification citations are in parenthesis):

1. A method of forming heat exchange surfaces on a core object, comprising:

placing at least a part of a thermally conductive core object within a mold cavity that includes a formation that defines one or more fins as heat exchange surfaces about the core object (page 4, lines 16-19; page 8, line 1 to page 9, line 17; and page 17, lines 1-10)**;**

injecting a heated metal slurry into the formation that defines the fins under a predetermined pressure to substantially simultaneously form the fins (page 2, lines 16-20; page 4, lines 20-21; and page 8, line 1 to page 9, line 17)**; and**

cooling the heated metal slurry to form a contact area that provides a substantially continuous void free interface between the core object and the fins when hardened for effective heat transfer across the contact area (page 2, lines 16-20; page 4, line 21 to page 5, line 3; page 8, line 1 to page 9, line 17; and page 16, line 11 to page 17, line 10)**.**

Independent claim 9 reads as follows:

9. A method of forming heat exchange surfaces on a core object, comprising:

arranging a first series of die plates in tandem for linear movement about a first perimeter of a first molding apparatus (page 9, lines 18 to 23)**;**

arranging a second series of die plates in tandem for linear movement about a second perimeter of a second molding apparatus (page 9, lines 24 to page 10, line 4)**;**

forming each of the first series of die plates to define first parts of one or more fins as heat exchange surfaces about the core object (page 10, lines 10-13; and page 17, lines 1-10)**;**

forming each of the second series of die plates to define corresponding second parts of one or more of the fins as said heat exchange surfaces about the core object (page 10, lines 10-13; and page 17, lines 1-10)**;**

positioning the first and the second molding apparatuses so that corresponding ones of the first and the second die plates face one another while being displaced by the apparatuses along an axial direction with respect to an elongated thermally conductive core object (page 10, line 4 to page 11, line 4)**;**

placing the core object between the facing ones of the first and the second series of die plates (page 11, lines 4-22)**;**

urging the facing die plates to a closed position thus forming full mold cavities corresponding to the fins about the core object (page 10, line 4 to page 11, line 4; and page 17, lines 1-10)**;**

injecting a heated metal slurry into the full mold cavities under a predetermined pressure to substantially simultaneously form the fins (page 11, lines 1-3)**; and**

cooling the heated metal slurry to form a contact area that provides a substantially continuous void free interface between the core object and the fins when hardened for effective heat transfer across the contact area (page 2, lines 16-20; page 4, line 21 to page 5, line 3; page 8, line 1 to page 9, line 17; and page 16, line 11 to page 17, line 10)**.**

In order to make the overview set forth above concise the disclosure that has been included, or referred to, above only represents a portion of the total disclosure set forth in the Specification that supports the independent claims.

(ii). The Remainder of the Specification Also Supports the Claims

The Appellants note that there may be additional disclosure in the Specification that also supports the independent and dependent claims. Further, by including the specification citations in parenthesis above the Appellants do not represent that this is the only evidence that supports the independent claims nor do Appellants necessarily represent that these citations alone can be used to fully interpret the claims of the present invention. Instead,

the citations provide background support as an overview of the claimed subject matter.

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL:

Appellants seek the Board's review and reversal of: (a) the rejection of claims 1-4, 6-8 and 19 under 35 U.S.C. §103(a) based on the combination of Miki in view of Bradley; and (b) the rejection of claims 9-12, 14-16 and 20 under 35 U.S.C. §103(a) based on the combination of Miki, Bradley, and the 944 reference.

VII. ARGUMENTS:

A. The 35 U.S.C. §103 Rejections

(1) claims 1-4, 6-8 and 19

Claims 1-4, 6-8 and 19 were rejected under 35 U.S.C. §103(a) based on the combination of Miki in view of Bradley. Appellants respectfully disagree for at least the following reasons.

(i) The combination of Miki and Bradley does not disclose or suggest cooling a heated metal slurry to form a contact area that provides a substantially continuous void free interface between a core object and fins.

Neither Miki nor Bradley, taken separately or in combination, disclose or suggest the feature of cooling a heated metal slurry to form a contact area that provides a substantially continuous void free interface between the core object and fins when hardened for effective heat transfer across a contact area, as in claim 1.

The Examiner appears to acknowledge that neither Miki nor Bradley explicitly discloses the formation of a substantially continuous void free interface. Nonetheless, the Examiner appears to take the position that such a combination implicitly discloses or suggest such a feature because the

combination of Miki and Bradley "...is expected to form the fins substantially simultaneously and to have a substantially void free interface between the core and the metal slurry since the semi-solid slurry of Bradley is also injected into the mold cavity of Miki to unite the core perform".

The Examiner does not provide any evidence or support for such an "expectation". Nor is there any, other than the disclosure in the instant application which, as the Examiner knows well, cannot be used to reject the claims.

The Examiner also appears to have ignored the phrase "substantially continuous void free interface" based on the rationale that the word "substantially" is an impermissible "qualitative expression". Appellants disagree.

When a word of degree, such as "substantially", is used in a claim the Federal Circuit has stated that the USPTO must determine whether the specification provides some standard for measuring that degree. In particular, the USPTO must decide whether one of ordinary skill in the art would understand what is claimed when the claim is read in light of the specification (see for example, *Seattle Box Company, Inc. v. Industrial Packing, Inc.*, 731 F.2d 818, 826, 221 USPQ 568, 573-74 (Fed. Cir. 1984)). Further, even though the word "substantially" may sometimes be imprecise, when it is used in conjunction with another phrase to modify such a phrase, its imprecision cannot be allowed to negate the meaning of the phrase it modifies (see for example, *Ex parte Daniel J. Bonner*, Appeal No. 1998-1454 (BPAI, October 18, 1999) and *cases* cited therein).

Here, the use of the word "substantially" is intended to indicate that almost all of the "air voids" (see page 2, lines 16-20 of the instant specification) in a contact area between a core object and fins are removed by the cooling step in claims 1 and 9; it was not intended to broaden the scope of the phrases

"cooling area" or "void free interface" and does not otherwise negate the meaning of these phrases.

In sum, the Appellants submit that the Examiner has impermissibly ignored the phrase "substantially continuous void free interface" in rejecting the claims because such a phrase would be understood by one of ordinary skill in the art.

When this phrase is properly considered the Appellants submit that the subject matter of claim 1 would not have been obvious to one of ordinary skill in the art at the time the application was filed based on the combination of Miki and Bradley.

Yet further, the Appellants submit that due to the known, markedly different chemical and physical properties between a semi-solid and a liquid metal one of ordinary skill in the art would not expect that combining Bradley and Miki would result in the formation of a contact area that provides a substantially continuous void free interface between a core object and fins (hereafter referred to as the "claimed invention" for the sake of brevity only). To the contrary, it is likely that one of ordinary skill in the art would recognize that many parts, components and specifications of Miki and Bradley would have to be changed--- from the diameter of Miki's tubing, to temperatures and pressures, to the specific process and steps employed in both Miki and Bradley. Further, without question such a skilled artisan would recognize that Miki's process was not designed for semi-solids and appears to operate at higher casting temperatures then the melting point of Bradley's semi-solids (compare Miki, col. 7 at Table 1, with Bradley, col. 6 ln 17-21.), all of which would most likely lead one of ordinary skill in the art to expect that the combination of Miki and Bradley would not result in the claimed invention and/or, in order to do so would require either Miki, or Bradley, or both to

change their principles of operation, which is impermissible (see arguments below).

Indeed, the Appellants respectfully submit that it is doubtful that one of *extraordinary* skill in the art would have expected the combination of Miki and Bradley to result in the claimed invention.

Paraphrasing the BPAI in *Ex parte Armitage* (Appeal No. 2008-004803, decided September 4, 2009, page 10) the Appellants submit that "even an artisan possessing creativity and common sense, and having knowledge of" methods of injecting semi-solid slurries into a casting die would not have reasonably combined Miki and Harvey "in the manner suggested by the Examiner, but for having the benefit of the instant claims to impermissibly use as a guide."

(ii) The combination of Miki and Bradley is impermissible

As briefly stated above, the combination cited by Examiner is impermissible because such a combination would render one or both of the references unsatisfactory for its intended purpose. The Appellants believe that one of ordinary skill in the art would recognize that it would be impractical to combine the two processes as the Examiner has suggested to arrive at the claimed invention at least because Miki's process is incompatible with the lower temperature and pressure requirements of Bradley.

To begin with, one skilled in the art would recognize that the thixotropic slurry of Bradley has a higher viscosity than the molten metal of Miki (see, e.g., the paragraph bridging columns 13-14 of Bradley). Because of this difference in viscosity one skilled in the art would have been discouraged, not encouraged, to combine Miki and Bradley to create a substantially continuous void free interface, as set forth in the claims.

Said another way, in order to combine the two references at least Miki would have to change its principle of operation in order to operate using the

higher viscosity, thixotropic slurries of Bradley. Such a change is impermissible because it would render Miki unsatisfactory for its intended purpose of operating using molten metals.

Miki and Bradley appear directed at two different and incompatible processes. For example, in Miki a "pressure resisting medium" is injected into the interior of a hollow member together with movable plugs so that high temperature and high pressure injection of molten metals can be completed without deforming the hollow member (see Miki at col. 2 ln 27-51). In contrast, Bradley does not require the use of a pressure resisting medium because Bradley first converts pellets of feed stock to a semi-solid state (see Bradley, col. 4 ln 19) and then uses a screw extruder to inject semi-solid material apparently at a minimum of heat and pressure (see col. 4 ln 12-39, and Fig. 2). One skilled in the art would recognize that, to combine the two references would require Bradley to change its principle of operation to incorporate Miki's hollow member, together with movable plugs; this is impermissible.

In rebuttal the Examiner appears to rely on U.S. Patent No. 5,433,511 to Wei ("Wei") for the proposition that it is "a common practice to inject either molten metal or semi-solid into a mold cavity to form a cast article" (see Office Action, page 5).

In their Request For Reconsideration the Appellants respectfully requested clarification of the Office Action. In particular, the Appellants requested that the Examiner indicate whether the Examiner is rejecting claims 1-4, 6-8 and 19 based on the combination of Miki, Bradley and Wei. The Examiner did not do so in the Advisory Action.

For the purpose of Appellants' present appeal, the Appellants will presume that the Examiner is rejecting the claims based on the combination of all three references.

The Examiner's reliance on Wei appears to be misplaced. The subject matter of Wei appears to be directed to casting materials that are combinations of metal alloys, formed from a metal matrix composite specifically including a variety of nonmetallic reinforcing material (see Wei, col. 2 ln 26-29).

One of ordinary skill in the art would recognize that, as explained in detail above with respect to Miki and Bradley, choosing a casting process depends to a great extent on the type of material being cast. In particular, on the chemical and physical properties of the material. Because Wei's materials are markedly different than the materials used in either Miki or Bradley, such a skilled artisan would recognize that combining Miki, Bradley and Wei would no doubt require one or more of these references to change their principle of operation; which again is impermissible.

The Examiner also appears to rely on U.S. Patent No. 6,151,198 to Prater ("Prater") for the proposition that the "potential benefits that could result from forming processes utilizing semi-solid metal [to] differentiate these processes from conventional casting" (see Office Action, page 5) would "further motivate those of ordinary skill in the casting art to use the semi-solid Mg alloy of Bradley et al as a casting material in the process of making heat exchanger [sic] of Miki et al" (see page 6).

As with Wei, the Appellants respectfully requested clarification of the Office Action. In particular, the Appellants requested that the Examiner indicate whether the Examiner is rejecting claims 1-4, 6-8 and 19 based on the combination of Miki, Bradley, Wei and Prater. The Examiner did not do so in the Advisory Action.

For the purpose of Appellants' present appeal, the Appellants will presume that the Examiner is rejecting the claims based on the combination of all four references.

Whether benefits flow or not from processes utilizing semi-solid metals is not determinative of whether one skilled in the art would have combined some combination of Miki, Bradley, Wei and Prather to arrive at the claimed invention in light of the substantial difficulties in doing so, some of which are discussed above.

Accordingly, the Appellants submit that the subject matter of claims 1-4, 6-8 and 19 would not have been obvious to one skilled in the art at the time the application was filed based on the combined disclosures of Miki, Bradley, Wei and Prather.

(2) claims 9-12, 14-16 and 20

Claims 9-12, 14-16 and 20 were rejected under 35 U.S.C. §103(a) based on the combination of Miki, Bradley, and Japanese reference JP 6-292,944 ("944 reference"). Appellants respectfully disagree for at least the following reasons.

In one of their previous responses the Appellants noted that the Examiner had not articulated how Miki and Bradley were being applied to claims 9-12, 14-16 and 20 (i.e., what features are purportedly disclosed by Miki? by Bradley?). In response, it appears that the Examiner has still not articulated what features of claims 9-12, 14-16 and 20 are disclosed by Miki and/or Bradley. Therefore, the Appellants submit that the Examiner's stated rationales are insufficient to support a *prima facie* rejection under U.S.C. §103(a). Accordingly, in their last response the Appellants requested that the Examiner clarify the rejections in the Advisory Action or else withdraw the rejections. However, the Examiner did not do so in the Advisory Action.

The brief rationale supplied by the Examiner in the Final Office Action focuses on the '944 reference. The Examiner states that the '944 reference "show to [sic] continuous cast articles by using a continuous casting machine, which consists of two series of die plates, such that to speed up the casting

process". This rationale is essentially the same one set forth by the Examiner in a previous Office Action, though now relied on to support the addition of the '944 reference.

Presumably the Examiner's rationales for applying Miki and Bradley are the same as in claims 1-4, 6-8 and 19. Accordingly, similar to the rationales set forth above, neither Miki nor Bradley, taken separately or in combination, discloses the feature of cooling a heated metal slurry to form a contact area that provides a substantially continuous void free interface between a core object and fins when hardened for effective heat transfer across the contact area, as in claim 9. Nor does the '944 reference make up for the deficiencies in Miki and Bradley.

In addition, the combination of Miki and Bradley is impermissible as discussed above.

In one of their previous responses the Appellants noted that because the '944 reference is in the Japanese language it is not possible for the Appellants to determine at this time whether the combination of the '944 reference, Miki and Bradley is permissible.

More specifically, while the Appellants thanked the Examiner for providing an English translation of the Abstract of the '944 reference, the Appellants stated that the Abstract does not provide enough detail. The Appellants pointed out, for example, that the translated Abstract does not discuss pressures or temperatures. Thus, the Appellants cannot yet determine whether the pressures or temperatures discussed in the '944 reference are suitable to be used at the pressures and temperatures disclosed in Miki and Bradley without destroying the structural integrity of the apparatus discussed in the '944 reference. The Appellants have previously requested a full translation of the '944 reference.

In response the Examiner states that the '944 reference "is cited simply to show that it is conventional to use a caterpillar type continuous casting machine for continuous casting metallic article, in lieu of conventional batch-wise casting process, to speed up output" (see page 6). While the Appellants appreciate this explanation it does not help resolve the issue of whether, for example, the pressures or temperatures discussed in the '944 reference are suitable to be used at the pressures and temperatures disclosed in Miki and Bradley without destroying the structural integrity of the apparatus discussed in the '944 reference, thus rendering the '944 reference unsatisfactory for its intended purpose.

The Appellants have previously requested that the Examiner indicate whether or not the Examiner has sent a translation to the Appellants. In the Advisory Action the Examiner indicates that the PTO did not send a translation for the '944 reference. The Appellants will attempt to obtain a translation of this reference prior to filing a Reply to the Examiner's expected Answer. That said, the Appellants respectfully request that the Examiner indicate whether he intends to re-open prosecution or file an Answer. If the Examiner intends to re-open prosecution this may save the Appellants the cost of such a translation should the Examiner re-open prosecution and not rely on the '944 reference.

Conclusion:

Appellants respectfully request that members of the Board reverse the decision of the Examiner and allow claims 1-4, 6-12, 14-16, 19 and 20.

The Commissioner is authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 50-3777 for any additional fees required under 37 C.F.R. § 1.16 or under 37 C.F.R. § 1.17; particularly, extension of time fees.

Respectfully submitted,
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VIII. CLAIMS APPENDIX

1. A method of forming heat exchange surfaces on a core object, comprising:

placing at least a part of a thermally conductive core object within a mold cavity that includes a formation that defines one or more fins as heat exchange surfaces about the core object;

injecting a heated metal slurry into the formation that defines the fins under a predetermined pressure to substantially simultaneously form the fins; and

cooling the heated metal slurry to form a contact area that provides a substantially continuous void free interface between the core object and the fins when hardened for effective heat transfer across the contact area.

2. A method according to claim 1, including heating a metal to a thixotropic state, and then performing said injecting step using the heated thixotropic metal as said metal slurry.

3. A method according to claim 2, including raising the temperature of the metal to about 900 degrees F. prior to said injecting step.

4. A method according to claim 2, including using type AZ91D magnesium alloy as said metal, and raising the temperature of said alloy to about 900 degrees F. prior to said injecting step.

5. (Canceled).

6. A method according to claim 1, including providing a heat conductive pipe as said core object.

7. A method according to claim 6, including inserting a rigid rod axially through the pipe thus avoiding deforming of the pipe during the injecting step.

8. A method according to claim 7, including forming the mold cavity to define the one or more fins about the outer circumference of the pipe.

9. A method of forming heat exchange surfaces on a core object, comprising:

arranging a first series of die plates in tandem for linear movement about a first perimeter of a first molding apparatus;

arranging a second series of die plates in tandem for linear movement about a second perimeter of a second molding apparatus;

forming each of the first series of die plates to define first parts of one or more fins as heat exchange surfaces about the core object;

forming each of the second series of die plates to define corresponding second parts of one or more of the fins as said heat exchange surfaces about the core object;

positioning the first and the second molding apparatuses so that corresponding ones of the first and the second die plates face one another while being displaced by the apparatuses along an axial direction with respect to an elongated thermally conductive core object;

placing the core object between the facing ones of the first and the second series of die plates;

urging the facing die plates to a closed position thus forming full mold cavities corresponding to the fins about the core object;

injecting a heated metal slurry into the full mold cavities under a predetermined pressure to substantially simultaneously form the fins; and

cooling the heated metal slurry to form a contact area that provides a substantially continuous void free interface between the core object and the fins when hardened for effective heat transfer across the contact area.

10. A method according to claim 9, including heating a metal to a thixotropic state, and then performing said injecting step using the heated thixotropic metal as said metal slurry.

11. A method according to claim 10, including raising the temperature of the metal to about 900 degrees F. prior to said injecting step.

12. A method according to claim 10, including using type AZ91D magnesium alloy as said metal, and raising the temperature of said alloy to about 900 degrees F. prior to the injecting step.

13. (Canceled).

14. A method according to claim 9, including providing a heat conductive pipe as said elongated core object.

15. A method according to claim 14, including inserting a rigid rod axially through the pipe, thus avoiding deforming of the pipe during the injecting step.

16. A method according to claim 15, including forming the die plates to define the one or more fins about the outer circumference of the pipe.

17. (Canceled).

18. (Canceled).

19. A method according to claim 1, wherein the fins and the core object are comprised in a heat sink arrangement for an electronic component.

20. A method according to claim 9, wherein the fins and the core object are comprised in a heat sink arrangement for an electronic component.

IX. EVIDENCE APPENDIX

None.

X. RELATED PROCEEDINGS APPENDIX

None.